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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/575,489	04/12/2006	Hiroshi Fukushima	P29715	1539
7055	7590	12/11/2008	EXAMINER	
GREENBLUM & BERNSTEIN, P.L.C. 1950 ROLAND CLARKE PLACE RESTON, VA 20191				YANG, MINCHUL
ART UNIT		PAPER NUMBER		
		2891		
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

gbpatent@gbpatent.com  
pto@gbpatent.com

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/575,489	FUKSHIMA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Minchul Yang	2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 9/16/08.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1,2,4-6,8-10,12 and 14-18 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-2, 4-6, 8-10, 12, and 14-18 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/22/08</u> .   | 6) <input type="checkbox"/> Other: _____ .                        |

## **Detailed Action**

1. Claims 1-2, 4-6, 8-10, 12, and 14-18 are pending in the application. Claims 3, 7, 11, and 13 are cancelled. Claims 15-18 are newly added. Claims 1-2, 4-6, 8-10, 12, and 14-18 are examined in this Office action.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 4-6 and 8-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Several limitations of claim 4 are not clear as to what they are intended to mean, rendering the claim indefinite. For instance, Claim 4 recites “a mold”. It is not clear whether this limitation recites “a mold” of claim 1 or a new element. Claim 4 recites a step of “pressing a mold...to be located near the bottoms of the minute unevenness structure for preventing the multiple reflections”. This is not consistent with claim 1, because the minute unevenness structure for preventing the multiple reflection of claim 1 is a final product after the molding and the dry etching steps, but the molding step of claim 4 is directed to molding the final product, which is not supported by the rest of the disclosure. Claim 4 recites “the upper semiconductor layer” that lacks sufficient antecedent basis. Any claim not specifically addressed above is being

rejected as incorporating the deficiencies of a claim upon which it depends. Appropriate correction is required. Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-2, 4-6, 10, and 14-18 are rejected under 35 U.S.C. 103(a) as being anticipated by Okazaki (US Patent 6495862), in view of Wierer (US Pub. 2005/0082545) and Weller (US Pub. 2002/0132083).

(a) Okazaki discloses a method of making an LED, comprising steps of:

Regarding claim(s) 1: forming a transfer layer on at least a part of the transparent crystal substrate or the light-emitting layer (col. 5, lines 31 -35), softening or setting said transfer layer upon supplying an energy thereto (col. 5, lines 43-46); forming a minute unevenness structure for preventing multiple reflection based on the minute unevenness structure transferred to the transfer layer (col. 5, lines 47-52);

Regarding claim(s) 2: separating the transparent crystal substrate from the light-emitting layer after a substrate bearing layer is formed on a surface of the light-emitting layer where electrodes are to be formed (col. 13, lines 1-3).

(b) Regarding claim(s) 1, Okazaki discloses the features previously outlined, but does not

expressly disclose the following limitation(s): pressing a mold formed with a minute unevenness structure against the transfer layer to transfer the minute unevenness structure to an outer surface of the transfer layer; dry etching the transfer layer with a chlorine gas using the transfer layer as a resist mask to form the minute unevenness structure.

However, Wierer teaches a method of making an LED comprising (see, e.g., figures 16-19 and related text) a step of pressing a mold formed with a minute unevenness structure (0056: the microcontact printing and nano-imprinting use a mold with a minute unevenness structure) against the transfer layer (202) to transfer the minute unevenness structure to an outer surface of the transfer layer (figure 17); dry etching (0056) the transfer layer with a chlorine gas (note that chlorine is a typical etchant gas for drying etching; see also Okazaki, col. 5, lines 48-58) using the transfer layer as a resist mask to form the minute unevenness structure (figure 18) for preventing the multiple reflection in the transparent crystal substrate or the light-emitting layer (the corrugated LED surface of Okazaki in view of Wierer is capable of preventing the multiple reflection). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the minute unevenness structure of Okazaki using the imprinting method of Wierer that could benefit to eliminate steps required in a photo-lithographic method and thereby reduce manufacturing time/cost.

(b) Regarding claim(s) 1 and 15-16, Okazaki in view of Wierer teach the features previously outlined, but do not expressly teach the following limitation(s): the transfer layer is from a silicon organic solvent comprising TEOS and one of alcohol, ester, and ketone. However, it was well recognized in the art that TEOS was a typical material to form a patterned mask and used in a form of solution in alcohol, ester, or ketone. For instance, Weller teaches (0034) that a

topographical pattern can be made by a nano-imprinting method, wherein a TEOS layer is deposited, imprinted to form a patterned mask, and etched to leave a patterned underlying surface. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a TEOS solution in alcohol, ester, or ketone for the transfer layer of Okazaki in view of Wierer, because TEOS was a typical material to form a patterned mask with a high adhesiveness and a suitable etching rate for the intended use.

(c) Regarding claim(s) 1, Okazaki in view of Wierer teach the features previously outlined, but do not expressly teach the following limitation(s): a pressing pressure of the mold is 5 MPa or higher and 150 MPa or lower.

However, it was well recognized in the art that a pressing pressure of a mold is one of parameters that determine a final structure of a resist in terms of pitch-to-pitch distances, height distributions, and regularities of the molded pattern in the resist. For instance, if the pressing pressure is too low, the molded pattern of the resist would have a less sharpness than that of the mold. If the pressing pressure is too high, the resist would be at risk of damage. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to one of ordinary skill in the art at the time the invention was made to use a pressing pressure in the claimed range in the imprinting method of Okazaki in view of Wierer for optimization. Examiner notes that: “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation”: In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art: In re Boesch, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

(d) Regarding claim(s) 4, Okazaki in view of Wierer and Weller teach the features previously outlined, but do not expressly teach the following limitation(s): a mold having an upper flat portion to be located near the bottoms of the minute unevenness structure for preventing the multiple reflection and a lower flat portion to be located at a position lowered from the upper flat portion by about the thickness of the upper semiconductor layer of the light-emitting layer against the transfer layer to transfer an upper flat portion and a lower flat portion together with the minute unevenness structure to the transfer layer. This has no patentable weight because the recited structural limitation must affect the method in a manipulative sense, and not amount to the mere claiming of a use of a particular structure. Ex parte Pfeiffer, 1962 C.D. 408 (1961).

Regarding the limitation "forming electrode-forming portions by etching the upper and lower semiconductor layers of the light-emitting layer when dry etching is carried out using the transfer layer as a resist mask", it would have been obvious to one of ordinary skill in the art at the time the invention was made to place electrodes at either end of the active layer, since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

(e) Regarding claim(s) 1, 10, and 17, Okazaki in view of Wierer and Weller teach the features previously outlined, but do not expressly teach the following limitation(s): adjusting a selection ratio of the etching speed of the light-emitting layer to that of the resist from twofold to fourfold; wherein the silicon organic solvent is applied at a thickness of 2  $\mu\text{m}$  or greater.

However, it was well recognized in the art that a selection ratio of the etching speed between a resist and an underlying layer as well as the transfer layer thickness are parameters

that determine a final structure of the etched underlying layer in terms of pitch-to-pitch distances, height distributions, and regularities of the etched pattern in the underlying layer. For instance, if the etching speed of the resist is higher than that of the underlying layer, the etched pattern of the underlying layer would have a less sharpness than that of the pattern of the resist. A too thick transfer layer increases molding and etching time, while a too thin transfer layer increases the risk of etching the entire surface of the underlying surface. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to adjust a selection ratio of the etching speed of the light-emitting layer to that of the resist from twofold to fourfold and the transfer layer thickness for optimization.

(f) Regarding claim(s) 6 and 14, Okazaki in view of Wierer and Weller teach the features previously outlined, but do not expressly teach the following limitation(s): applying the silicon organic solvent by potting or spray coating. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the silicon organic solvent by potting or spray coating, because these are typical methods of forming a layer of a silicon organic solvent with a benefit of simplicity of the process.

(g) Regarding claim(s) 18, Okazaki in view of Wierer and Weller teach the features previously outlined, but do not expressly teach the following limitation(s): wherein the method further comprises post-baking the transfer layer at or below 120°C after the minute unevenness structure is transferred to the transfer layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to post-bake the transfer layer at or below 120°C after the minute unevenness structure is transferred to the transfer layer in order to harden the transfer layer and evaporate any liquid therein without damaging the structure.

6. Claims 8-9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okazaki in view of Wierer and Weller, as applied to the claims above, and further in view of Holman (US Pub. 2004/0080938).

(a) Regarding claim(s) 8, Okazaki in view of Wierer and Weller teach the features previously outlined, but do not expressly teach the following limitation(s): "unevenness structure larger than the minute unevenness structure on the minute unevenness structure of the light-emitting layer". However, Holman teaches, "unevenness structure larger than the minute unevenness structure on the minute unevenness structure of the light-emitting layer" for the benefit of well defined and controllable illumination (0038, and Fig. 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the unevenness structures of Holman in the method of Okazaki in view of Wierer and Weller for the benefit of well defined and controllable illumination.

(b) Regarding claim(s) 9, Okazaki in view of Wierer, Weller, and Holman teach the features previously outlined. Poicus further discloses the unevenness structure has the shape of a prism or a microlens (Fig. 9).

(c) Regarding claim(s) 12, Okazaki in view of Wierer and Weller teach the features previously outlined, but do not expressly teach, "unevenness structure larger than the minute unevenness structure on the minute unevenness structure of the light-emitting layer". However, Holman teaches, "unevenness structure larger than the minute unevenness structure on the minute unevenness structure of the light-emitting layer" for the benefit of well defined and controllable illumination (0038-0039, and Fig. 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the unevenness

structures of Holman with the method of Okazaki in view of Wierer and Weller for the benefit of well defined and controllable illumination.

***Response to Arguments***

7. Applicant's arguments filed on 9/16/08 have been considered but are moot in view of the new ground(s) of rejection.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Minchul Yang whose telephone number is (571) 270-1750. The examiner can normally be reached on Monday through Friday 7:30 AM - 5:00 PM E.S.T..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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MY /M. Y./

Examiner, Art Unit 2891

/Wael M Fahmy/

Supervisory Patent Examiner, Art Unit 2814